

TWO NEW GENERA OF COCKROACHES FROM INDIA AND PERU
(DICTYOPTERA: BLATTARIA, BLABERIDAE)

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ABSTRACT—*Princisola*, a new genus from India, is based on the previously described *Audreia pulchra* Shelford. True *Audreia*, a relative of *Epilampra*, is entirely Neotropical and differs from *Princisola* principally in the male subgenital plate and genitalia. *Orchidoeca peruvia*, a new genus and species from Peru, is closely related to *Dryadoblatta*.

In the course of our studies we have found 2 new genera of cockroaches. One is based on *Audreia pulchra* Shelford, described from India in 1910. We have examined the holotype and allotype of *pulchra* and find that this species does not properly belong to *Audreia* Shelford, now regarded as strictly Neotropical. The male of the other new genus and species has very distinctive dorsal abdominal specializations. It was received recently with Peruvian orchids and is closely related to *Dryadoblatta* Rehn, based on a species first found in Trinidad bromeliads in 1912. Both new genera are in the Blaberidae.

Roth (1970b) studied the male genitalia of the numerous species of *Epilampra* Burmeister and reviewed the validity of the genus *Audreia* (pp. 455-465). The type-species of *Audreia*, *Calolampra carinulata* Saussure, designated by Hebard (1920:92), appears generically distinct from *Epilampra*. The male genital differences are the lack of a subapical incision of the hooked sclerite of the right phallomere (R2) (fig. 11) and the relatively weak development of the dorsal sclerite (L2d) (fig. 6) of the ventromedial sclerite in *Audreia*. The L2d of *A. carinulata* (fig. 10) is a simple flattened sclerotized section of the preputial membrane, and the remainder of the prepuce is not shaped or sclerotized.

Shelford (1910) initially placed 8 species in *Audreia*. Princis (1967) added 4 others and later (1971:1157) added one more. The present generic disposition of the 12 species other than *carinulata* is as follows: *truncata* Brunner (*Calolampra* Saussure, Roth and Princis, 1973); *biolleyi* Saussure (*Litopeltis* Hebard, Rehn, 1928:179); *hamiltoni* Rehn, *heusseriana* Saussure, *exploratrix* Gurney, *bromeliadarum* Caudell, *gatunae* Hebard, and *fugax* Bonfils (*Epilampra*, Roth, 1970b); *cathar-*

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ina Shelford (*Poeciloderrhis* Stål, Roth, 1970a); *cicatricosa* Rehn (no reassignment published; male not known, type-female examined by Gurney and found not congeneric with *carinulata*); *jamaicana* Rehn and Hebard (no reassignment published; male not dissected, but females examined by Gurney and found probably to be in *Epilampra*). The type-specimens of *Audreia pulchra* have been studied recently, and we conclude that the species represents a new genus, here described. Except for *truncata* (from Australia) and *pulchra* (from India), all of the above mentioned species which were referred to *Audreia* are Neotropical, a geographic disparity which suggests that the assignment of those 2 species to *Audreia* is an unnatural one.

Princisola, Gurney and Roth, new genus

In its general appearance, this genus strongly suggests *Audreia*, which differs especially in the male subgenital plate and genitalia. *Princisola* can be separated from *Epilampra*, *Audreia*, *Calolampra*, *Calolamprodes* Bey-Bienko, and *Rhabdoblatta* Kirby by the presence of a tooth on the excavated right margin of the asymmetrical male subgenital plate. Additional differences between *Audreia* and *Princisola* are shown in Table 1. The male of *Calolamprodes*, of Burma and southern China, has fully developed tegmina and wings; the female has greatly reduced lateral tegmina and lacks wings. Unlike *Princisola* which has 2 rows of small ventral spines on tarsal segments 1 and 2 of the hind tarsus and segment 1 of the middle tarsus, *Calolamprodes* has a single ventral row of spinules on those segments (Bey-Bienko, 1969:840). During past years, a variety of species from several continents have been referred to *Calolampra*. In his catalogue, Princis (1963) placed 23 species there, some with a question. Many have since been removed, and the genus *Calolampra* is now mainly Australian (Roth and Princis, 1973). *Calolampra* differs from *Princisola*, in addition to the entire symmetrical subgenital plate which bears 2 styli of equal size, by the apparent absence of L2d and shape of L1 in the male genitalia.

Generic description: General form as in fig. 1 and 2. Interocular space about equal to distance between antennae. Pronotum wider than long, widest a little behind middle, posterior margin broadly angulate (δ) or truncate (φ). Tegmina (δ) well developed but abbreviated, and wings reduced; both completely absent in φ . Ventro-anterior margin of front femur with 4 large spines in basal half, followed by row of minute spines, then strong terminal spine; ventro-posterior margin with 1 subapical and 1 terminal spine; no genicular spine. Front tarsus with 1 small ventral spine on metatarsus. Hind metatarsus longer than (δ) or about equal to (φ) other segments combined. Hind leg with 2 rows of ventral spines on tarsal segments 1 and 2, segment 3 with several spines, chiefly in single row. Middle leg with 2 rows of spines on metatarsus, other seg-

Table 1. Differences between 2 species representing the genera *Princisola* and *Audreia*.

Character	<i>Princisola pulchra</i>	<i>Audreia carinulata</i>
Tegmina and wings	Abbreviated, not quite reaching hind margin of fifth tergum (fig. 2); wings greatly reduced, hidden under tegmen (♂). Both absent in ♀ (fig. 1).	Abbreviated but contiguous or overlapping, reaching to about hind margin of second tergum; wings very small, hidden under tegmen (♂ ♀).
Subgenital plate (♂)	Hind margin convex, right side broadly excavate, the posterior margin of concavity curved, forming a distinct tooth. Styli slender, the right longer than left (fig. 5).	Hind margin broadly concave, sides not excavate (fig. 14). Without a left stylus; right stylus slender (fig. 14).
Supra-anal plate (hind margin)	Weakly concave (♂, fig. 4), or entire (♀).	Mesally emarginate (♂ ♀). (♂, Fig. 13).
Front femur (Postero-ventral margin)	1 distal and 1 subapical spine.	Usually with 2 or 3 spines plus a distal spine.
Male genital phallomeres		
R2 (apex of hook)	Truncate bearing a conspicuous, recurved tooth on inner margin (fig. 8).	Curved with a small non-recurved tooth. (fig. 11).
L2d	Cylindrical sclerotization at end of preputial membrane (fig. 7).	Flattened, asymmetrical, sclerotized plate (fig. 10).
Sclerotized cleft of L1	Straight (fig. 9).	Curved (fig. 12).

ments unarmed ventrally. Pulvilli apical, and minute on segments 1–4 of hind tarsus. Arolium small; claws equal. No dorsal abdominal specialization in male. Supra-anal plate (fig. 4) broadly rounded, apex weakly emarginate (δ), or entire (φ). Cerci extending well behind supra-anal plate (fig. 4, (δ)) or short, trigonal, not reaching beyond supra-anal plate (fig. 1, φ). Male subgenital plate asymmetrical, right side broadly excavated with posterior margin of concavity recurved, forming a small tooth; styli of similar shape, but right stylus much longer than left (fig. 5). Female subgenital plate symmetrical, lateral margins somewhat undulate. Male phallomeres arranged as in fig. 6; L2d (fig. 7) poorly developed, separated from L2vm, preputial membrane weakly sclerotized; R2 (fig. 8) lacking subapical incision, apex truncate with small recurved hook on inner margin; L1 (fig. 9) with deep narrow straight cleft, its inner margins darkly sclerotized, lower (lateral) lobe with few widely scattered setae.

Type-species of genus: *Audreia pulchra* Shelford, 1910 (present designation).

The name *Princisola* is chosen as a tribute to Dr. Karlis A. Princis, the patient, thorough compiler of the Blattariae sections of the *Orthopterorum Catalogus*. Because of the short "o", the name is pronounced with the accent on the antepenultimate syllable, thus Princisola.

Princisola pulchra (Shelford), n. comb.

fig. 1–9

Male: Vertex visible from above. Tegmina reaching to anterior margin of 6th tergite; venation well marked, closely reticulated, humeral (mediastinal) area punctate. Ventro-anterior margin of middle femur with 3 large, widely spaced, spines and 1 terminal spine; long genicular spine present; ventro-posterior margin with 4–5 large, widely spaced spines and 1 terminal spine. Ventro-anterior margin of hind femur with 3 large, widely spaced spines, no apical spine; large genicular spine present.

Female: First valve of ovipositor (relaxed and exposed, now dry *in situ*) upcurved subapically, then extending posteriorly and secondarily upcurved; 3rd valve twisted and outcurved near apex. (Above-mentioned curvature of valves much more developed than in *Audreia carinulata*; structure of valves basically as illustrated for *Pycnoscelus* Scudder by McKittrick (1964:fig. 94).

Measurements (mm): Body length, 15 (δ), 19 (φ); length of tegmen, 8.4 (δ); pronotum length \times width, 4.5 \times 5.5 (δ), 4.5 \times 7.2 (φ).

Coloration: *Male*: Head piceous, vertex and face with broad testaceous longitudinal band; genae, clypeus, and mouthparts testaceous. Pronotal disk fusco-castaneous, narrow anterior and broader lateral margins testaceous, rufo-punctate. Humeral (mediastinal) area of tegmen testaceous, remainder castaneous and with fuscous spots; bases of subcosta and radius piceous. Terga brown, laterally testaceous and fusco-punctate; Sterna dark brown. Supra-anal plate with broad testaceous margin. Cerci with longitudinal median or testaceous line of more or less uniform width. Subgenital plate broadly margined with testaceous on left side and less so on right. Legs castaneous. *Female*: Thorax margined laterally with fusco-punctate testaceous. Abdomen above fusco-marmorate, beneath brown, becoming dark gray posteriorly. Cerci with a testaceous line broad at base and tapering toward apex.

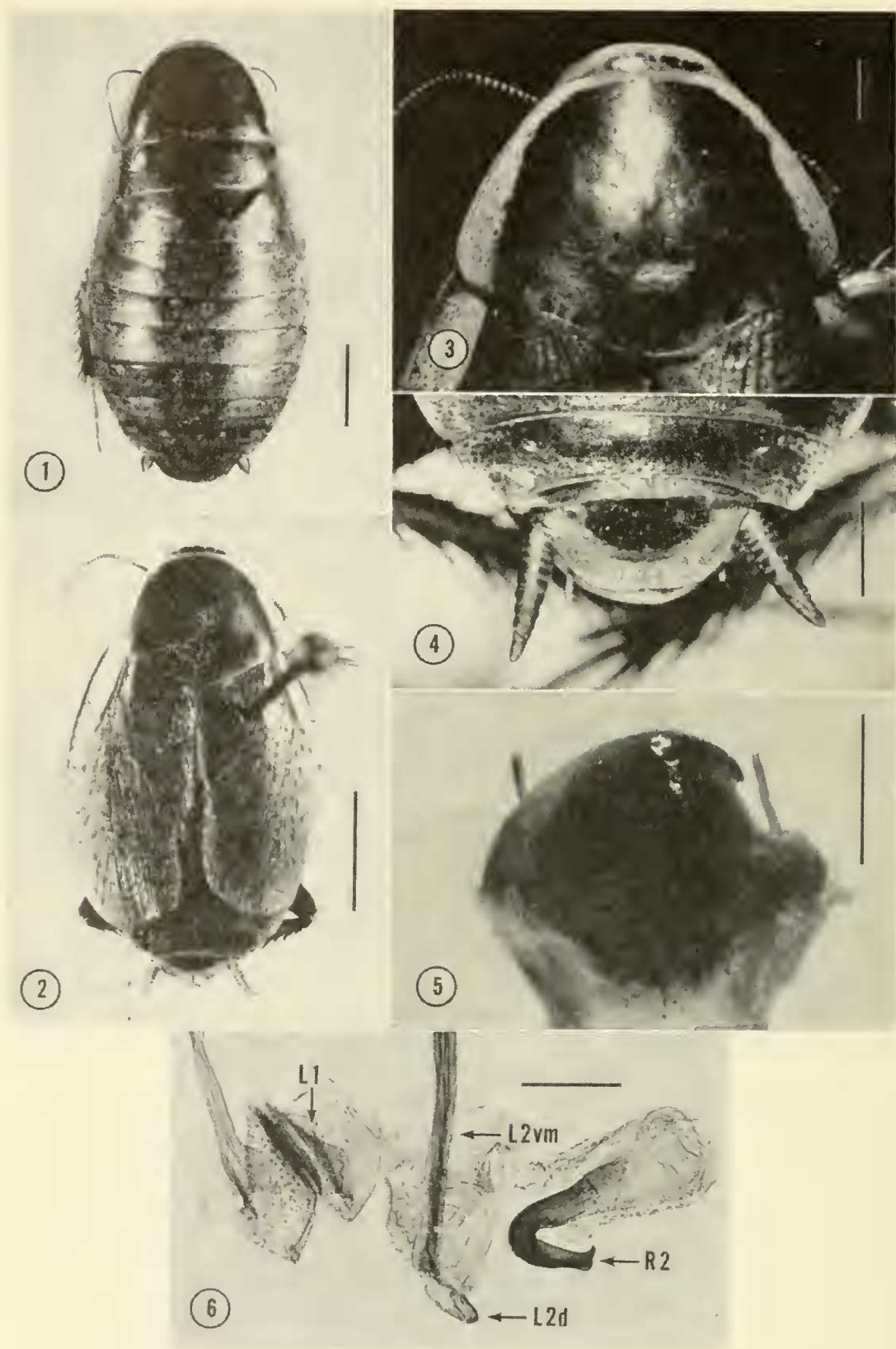


Fig. 1. *Princisola pulchra*. Female allotype (dorsal). Fig. 2-6. *P. pulchra*. Male holotype. 2, Habitus (dorsal). 3, Head, pronotum, and tegminal bases. 4, Apical portion of abdomen (dorsal). 5, Subgenital plate (ventral). 6, Male genital phallomeres (dorsal) (KOH preparation; phallomeres numbered accord-

Material examined: Male holotype, female allotype: Nilghiri, Coonoor (India) 1902. (M. Maindron). The second digit of the label date is unclear, the year is 1902. Desbordes (1912) stated that Maindron, an active collector in the Old World tropics, went to India on his last trip in 1901. Types in Muséum National d'Histoire Naturelle, Paris.

Comments: The male genital phallomere R2 of *pulchra* is reminiscent of the R2 of *Epilampra shelfordi* Hebard (fig. 357 in Roth, 1970b). The L2d in *shelfordi* is absent, and the unsclerotized prepupal membrane is in the form of a hollow round cylinder covered with microtrichia (fig. 356 in Roth, 1970b); the prepupal membrane in *pulchra* is also cylindrical in shape and minutely spicular, but the apex is sclerotized (fig. 7). The L1's of *shelfordi* (fig. 358 in Roth, 1970b) and *pulchra* (fig. 9) differ in the shape of the cleft.

Orchidoeca Gurney and Roth, new genus

This new genus is clearly recognized as a member of the Epilamprinae: Poroblattini by the male genitalia, especially the L2d and L1 as reviewed by Roth (1971). Within the Poroblattini, *Orchidoeca* approaches *Dryadoblatta* in habitus most closely, differing as follows: 1. Pronotum and tegmina deep liver brown in *Dryadoblatta*, bordered laterally with striking yellow longitudinal band; lighter general color and no such yellow band in *Orchidoeca*. 2. In *Dryadoblatta* ventro-anterior margin of front femur has 3 to 5 strong spines in basal half, followed by numerous delicate spines in apical half, finally 2 distal spines; *Orchidoeca* has 5 to 6 strong spines in basal three-fourths, followed by 3 delicate apical spines and finally 2 distal spines. 3. Pulvillus of hind metatarsus of *Dryadoblatta* occupies more than one-half ventral margin of segment, about 2 to 5 pairs of weak ventral spines near base; in *Orchidoeca* pulvillus occupies apical one-third or less of ventral margin, with many strong ventral spines in double row along surface not covered by pulvillus. *Dryadoblatta* has been well characterized by Rehn (1930:56-58; 1937:230-233).

Generic description: *Male*: Surface of pronotum and tegmina moderately shiny, scarcely punctate, with very sparse tiny setae, general form rather flattened. Vertex of head visible from above; interocular space clearly wider than distance between ocellar spots, about equal to distance between antennal sockets. Pronotum as in fig. 23. Tegmina (fig. 15) covering about $\frac{2}{3}$ of abdomen, corneous, venation distinct and prominent, anal sulcus strongly curved near apex, reaching posterior margin basad of mid-length of tegmen, a few rami anterior of subcosta weak and scarcely visible. Wing (fig. 16) somewhat parchmentlike, without apical triangle, probably nonfunctional, not quite reaching apex of teg-

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ing to McKittrick, 1964). Scale, fig. 1-2 = 4 mm, fig. 3-5 = 1 mm, fig. 6 = 0.5 mm.

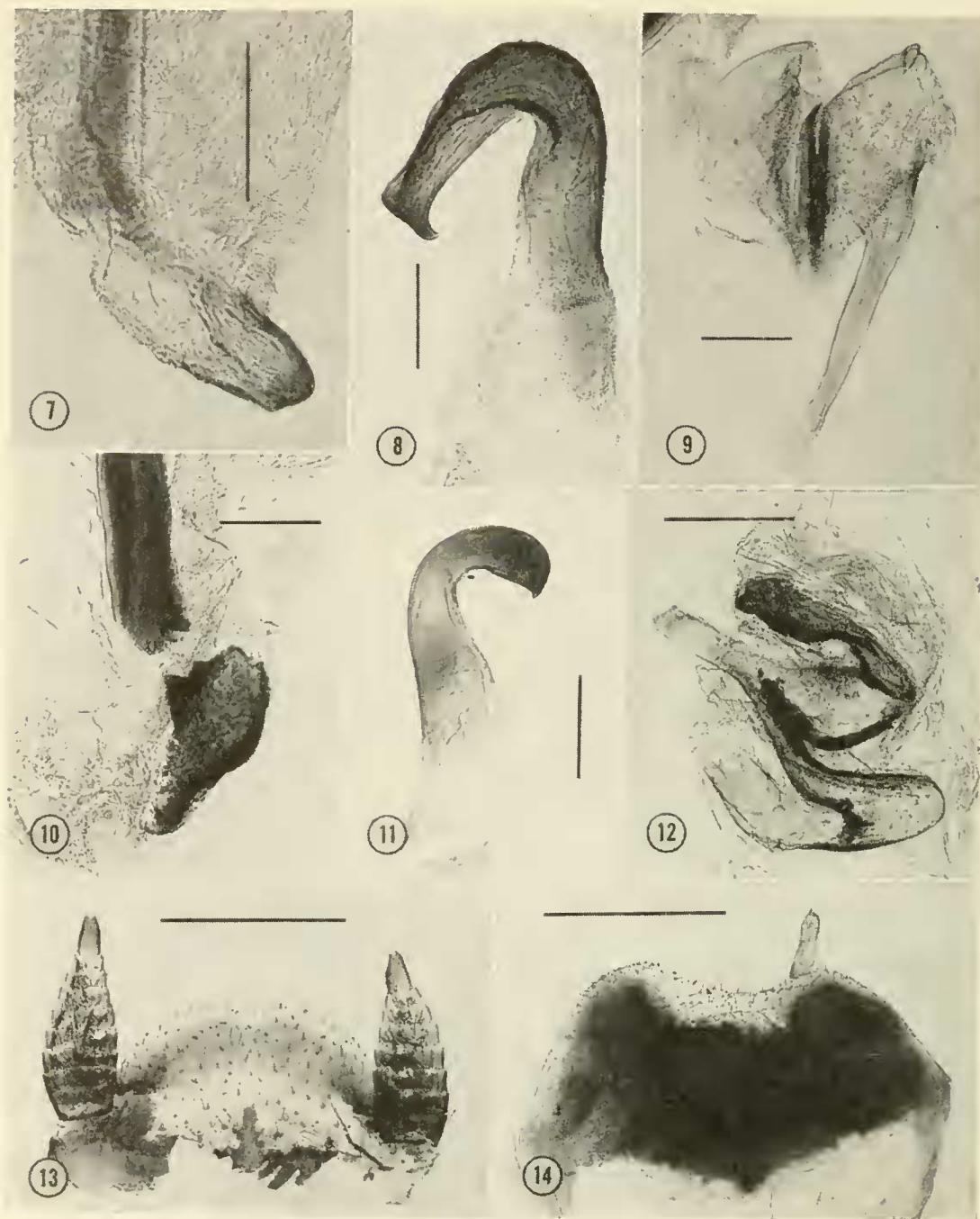


Fig. 7-9. *Princisola pulchra*. Male genital phallomeres L2d (and apex of L2vm), R2, and L1 (from fig. 6). Fig. 10-14. *Audreia carinulata* (Saussure). Male from Volcan Barba, Costa Rica. 10-12, Male genital phallomeres L2d (and apex of L2vm), R2, and L1. 13, Supra-anal plate and cerci (dorsal). 14, Sub-genital plate (ventral, left stylus absent). (All figures from KOH preparations; scale, fig. 7 = 0.1 mm, fig. 8, 10, 11 = 0.2 mm, fig. 9 = 0.3 mm, fig. 12 = 0.5 mm, fig. 13-14 = 1 mm).

men. Legs well spined, front femur as noted above. Hind metatarsus a little shorter than remainder of tarsus (as 18:21), segments 1 to 4 with conspicuous pulvilli, only metatarsus with ventral spines. Arolium large; claws equal.

Dorsum of abdomen (fig. 20-21) ornately specialized; short spiracular breath-

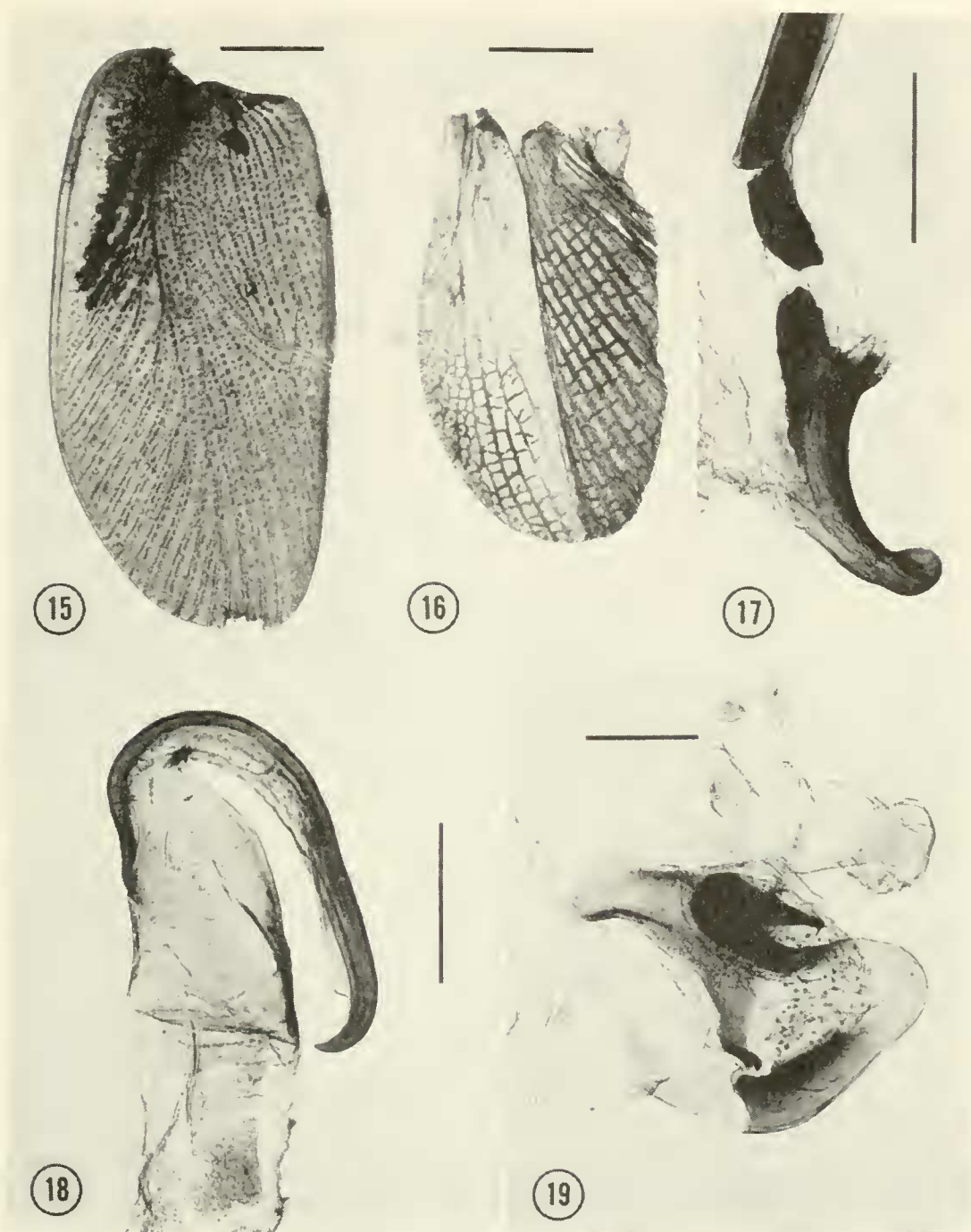


Fig. 15-19. *Orchidoeca peruvia*. Male holotype. 15, Left tegmen. 16, Left wing. 17-19, Genital phallomeres L2d (and apex of L2vm), R2, and L1. (KOH preparation; scale, fig. 15-16 = 2 mm, fig. 17-19 = 0.5 mm).

ing tubes from segment 8 beside bases of cerci; supra-anal plate broad, bilobed (fig. 20); subgenital plate (fig. 22) asymmetrical, with right stylus small, left stylus absent (?). Genitalia typical of Poroblattini; L2d elongate, curved, well sclerotized, separated from L2vm, without distinct prepuce (fig. 17); R2 (fig. 18) strongly-curved, lacking a subapical incision; L1 (fig. 19) with cleft and outer margin of lower lobe darkly sclerotized.

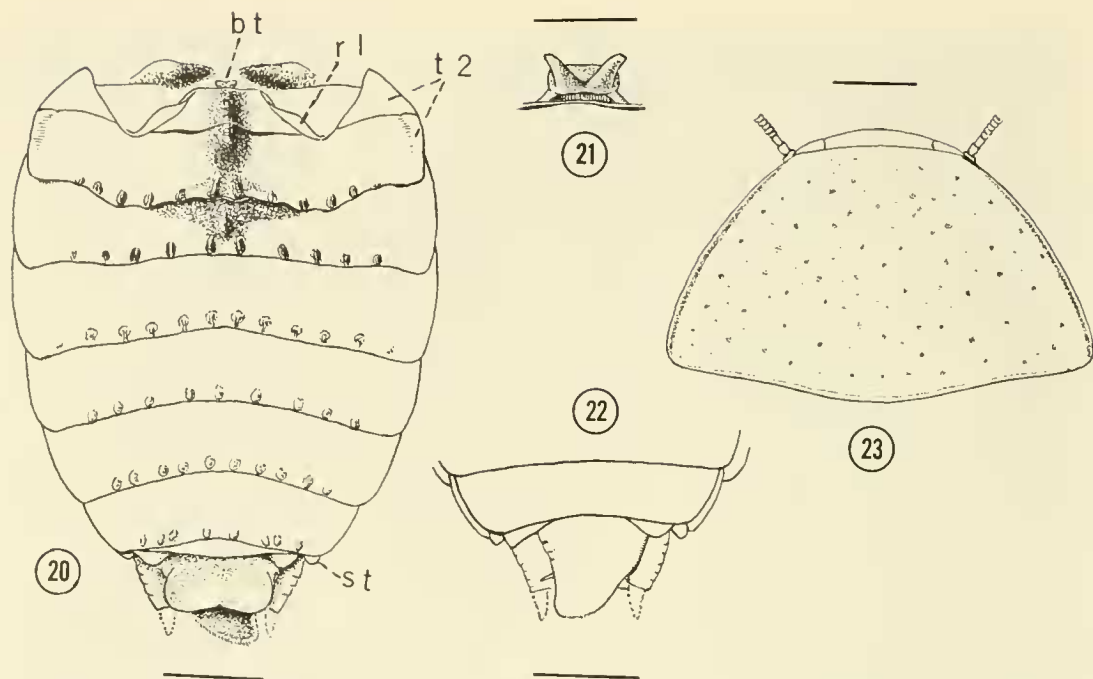


Fig. 20-23. *Orchidoeca peruvia*. Male holotype. 20, Dorsal view of abdomen. 21, Anterior view of bifurcate tubercle on first tergum. 22, Ventral view of apical portion of abdomen. 23, Dorsal view of head and pronotum. (bt = bifurcate tubercle of first tergum; rl = recurved lobe of first tergite; st = spiracular breathing tube of segment 8; t2 = second tergum showing transverse division of segment on dorsal surface. Scale, fig. 20, 22, 23 = 2 mm, fig. 21 = 1 mm).

The feminine name *Orchidoeca* is adapted from 2 Greek words which suggest living in orchids, though the single instance of the association for this species is insufficient evidence of restriction to this one plant group.

Type-species of genus: *Orchidoeca peruvia*, n. sp.

Orchidoeca peruvia Gurney and Roth, new species

fig. 15-23

Male: Vertex with 2 shallow depressions, 1 on each side of longitudinal parietal suture; compound eye extending onto gena considerably ventrad of antennal socket. First abdominal tergum nearly bisected longitudinally, a darkly sclerotized lobe near midline on each side in front, a thin recurved lobe of posterior margin (fig. 20, rl) behind; at posterior margin of 1st tergite, on midline, a small erect white bifurcate tubercle (bt), shown enlarged in anterior view in fig. 21; tergite 2 with large elongate tubercle on midline, traversing basal line of tergum, 6 tubercles of decreasing size on each side of midline along posterior margin; other terga with posterior marginal tubercles (fig. 20). Cerci extending somewhat beyond apex of supra-anal plate.

Measurements (mm): Length of body, 18; head width, 3.7; pronotum length \times width, 4.7 \times 8; tegmen length, 10; hind tibia length, 7.

Coloration: Pronotum pale yellow brown, darker on disk, with sparse sprinkling of small brown spots as in fig. 23. Tegmen (fig. 15) with basic ground color

somewhat more chestnut brown than brought out in photo; dark spot on posterior margin of anal area an artifact; a longitudinal streak anterior to subcosta cream colored. Wing not dark as in fig. 16, instead whitish (in dry preparation originally in alcohol). Most of head dark brown; ocellar spots, occiput, most of labrum, and apical portion of clypeus pale. Legs pale brown, tarsal segments narrowly blackish at apices. Dorsum of abdomen yellowish, sprinkled with tiny brown spots except for a wide blackish longitudinal band on middle $\frac{1}{3}$ extending with less intensity onto tergite 7; tubercles along posterior margins of terga pale. Venter of abdomen very dark brown, with more reddish hue in middle part, paler and with sprinkling of spots toward lateral margins; subgenital plate reddish dark brown.

Material examined: 1 (male holotype) (No. 73189, USNM). Peru; intercepted at Honolulu, Hawaii, April 7, 1964, alive when detected during Plant Quarantine inspection of orchids from Peru in air cargo.

Comments: The spiracular breathing tubes, borne on abdominal segment 8 and visible beside the cerci from above, are noteworthy as an adaptation for breathing when most of the body is submerged in water. Such breathing tubes were described by Shelford (1912:432) for *Homalopteryx scotti* (now *Dryadoblatta*) and earlier (Shelford, 1907:3) for certain Far Eastern Epilamprinae. Breathing tubes of this sort occur in a wide variety of Epilamprinae, even species which are not known to occur in water, but we have not made a sufficient survey to know what portion of the genera possess them. Some earlier descriptions (Shelford, 1907) relate the tubes to tergite 7, which results when the small first tergite of cockroaches is called the "median segment" rather than the first abdominal segment. Formerly, this practice was frequent among cockroach taxonomists.

Roth and Willis (1960:30-33, 151-152, 144-146) have documented records of cockroaches in aquatic habitats, those associated with orchids, and those with bromeliads, respectively. Neotropical cockroaches associated with plants which have water receptacles, as evidenced by Plant Quarantine interceptions which we have seen over a period of many years, as well as during some personal collecting, are numerous in both numbers of individuals and the variety of species encountered. Too few species of cockroaches have been recorded from orchids to indicate whether there is a significant difference in the cockroach faunas of orchids and bromeliads.

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